

Subliminal perception and parapsychology: points of contact

N.F. Dixon, Psychology Department, University College London

FYI Hal

While allowing that appearances may be deceptive there do appear to be such remarkable similarities between certain parapsychological phenomena and those associated with subliminal perception that it would seem worth considering the possibility that the two sets of phenomena depend at least in part on some of the same underlying processes.

By way of examining this hypothesis let us consider some ten paradigms which have, as their common denominator, the fact that a physical event, be it a word, a picture or the physiological substrate of a thought, occurring at a certain time and place can evoke a correlated happening, be it a gesture, a dream, a spoken word or some measurable physiological change, occurring at a different time and place, and all this without any awareness by the transmitter or the receiver, or indeed by any external observer, of the intermediate stages in this apparent communication. While all ten of these paradigms involve reception without awareness, culminating in some measurable behavioural or physiological response, nine of them have in common the fact that the causal link between the transmitting sources and the responding receiver is a definable physical stimulus. They also have in common that the overall signal/noise ratio for this stimulus is insufficient to activate cerebral processes which provide for awareness of an incoming stimulus.

The tenth paradigm is that which demonstrates what has, perhaps unjustifiably, been called extra sensory perception. It differs from the other nine in only one obvious respect - there is no known or definable physical stimulus to link events 'A' outside the organism with apparently correlated events 'B' inside the organism.

By way of trying to account for the data from this last paradigm let us look at the parameters of the other nine. Four of these are described at length in my book (Dixon 1971). They may be summarized as follows:

1. Subliminal determinants of perceptual experience

While it is axiomatic that all subjective perceptual phenomena, whether occurring in the waking or sleeping state, whether veridical or hallucinatory, must depend upon preceding preconscious processing by physiological mechanisms, a number of researches (Dixon 1971, Somekh and Wilding 1973, Henley and Dixon 1974, Henley 1975) have shown that visual or auditory stimuli at such low energy levels as to prevent consciousness of their presence may nevertheless influence the way in which a concurrent supraliminal stimulus is perceived. Adaptation level phenomena (e.g. the relative size of the different items in a sequence of stimulus presentations), the 'happiness', 'angriness', 'sadness' etc. of neutral faces, visual illusions, the size/colour/duration of After Images and After effects (Anderson et al. 1970; Smith et al. 1974) visual imagery evoked by supraliminal music (Henley and Dixon 1974), the meaning of supraliminal auditory homophones (Henley 1976) and visual content of dreams occurring in r.e.m. sleep (Berger 1966) have all been shown to be determined by the simultaneous presentation of visual or auditory stimuli of which the recipient remains wholly unaware.

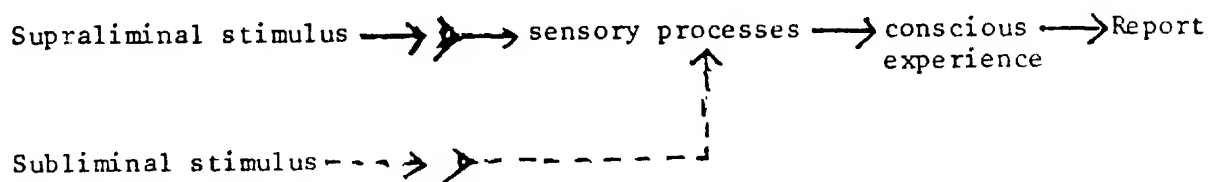
Perhaps the most striking and extensively researched of all these effects is that embodied in the Defence Mechanism Test (DMT) developed by Kragh (1962), which, after 15 years of follow up validation studies is now part of the standard selection procedure for Swedish Airforce applicants. In this test the applicants are required to reproduce (by drawing) a briefly exposed picture of a young man (the 'Hero' figure). In carrying out this task they remain unaware of the facts that, in addition to the centrally placed 'hero figure', the stimulus card includes, in its periphery, a small picture of an 'old ugly threatening male face', Though subliminal this peripheral stimulus appears to interfere with their perception of the central figure, and this as a function of the

who, in their drawings, demonstrate the operation of such defence mechanisms as 'isolation' 'denial' 'condemnation' etc have been found to have significantly higher accident proneness when flying and also to be significantly more predisposed towards psychosomatic illness than are those who remain relatively unaffected by the peripheral threatening face. Data from the DMT are of course closely akin to those of the Poetzl phenomena wherein unperceived parts of a perceptual display tend to emerge in subsequent dreams or associations.

One other finding from this group of studies which may have some significance for paranormal phenomena is the part played by laterality effects. In the experiment by Henley and Dixon (1974) successfully replicated by Mykel and Daves (1978) it was found that subliminal determination of auditory imagery only occurred when the supraliminal stimulus (orchestral music) was routed to the right hemisphere, and the subliminal cue words to the left hemisphere.

#### Subliminal determinants of verbal behaviour

In all the foregoing experiments subliminal effects were apparently mediated by ongoing conscious perceptual experience, as depicted in Figure 1.



As many researches have shown however, a conscious percept is not necessary for subliminal effects to occur.

Words or pictures too brief, or too weak, to enter conscious experience have been found to influence verbal 'guessing' behaviour (Dixon 1956, 1958, 1971, Gordon 1967, Spence and Holland 1962) and retrieval from long term memory of previously learned material (Spence and Ehrenberg 1964, Gordon and Spence 1966).

In these various researches three main effects were found. First, if allowed only a limited ensemble of possible responses (as in a typical card

guessing e.s.p. experiment) subjects tend to respond with items conveyed by the subliminal stimulus (see Miller 1939). If however the response ensemble is unlimited (i.e. 'the first word that comes to mind'), or includes associations to the stimulus material, then subjects tend to respond with a semantic associate to the stimulus. Often this semantically related response appears to bear a symbolic relationship to the stimulus (e.g. the subliminal stimulus 'Penis' evoked the response 'Cheroot'). Here again, as with the first category of experiments, interesting laterality effects have been found. Thus, in a recent study Fonagy (1977) has shown that if a subliminal word is presented to the right ear the response tends to be a logical secondary process association (e.g. 'Grass' → 'green'). If however the same stimulus is presented to the left ear the response tends to be of something which looks like the stimulus object (e.g. 'Grass' → 'hair' or 'bed of nails', and 'Arrow' → 'hook' or 'staple'). This implication of the right hemisphere in evoking concrete visual symbolic responses, is interesting in the light of the widely held view that whereas the left hemisphere is concerned with sequential logical linguistic processing the right hemisphere involves mechanisms for parallel spatial primary processing of incoming information (Ornstein 1977), whether this be sensory or extrasensory in origin.

#### Emotional factors

✓ Running through accounts of parapsychological phenomena is the suggestion that emotion and motivation appear to play a significant part in extrasensory perception. Here again, research on subliminal perception has produced comparable data the most extensive being that from studies of perceptual defence (Brown 1962, Dixon 1971, Erdelyi 1974). The main findings from this area of investigation may be summarized as follows:

(a) People have significantly longer (defence) or significantly shorter (vigilance) exposure duration thresholds for tachistoscopically exposed emotive material than they have for emotionally neutral stimulus items.

(b) The relationship between threshold and anxiety may be represented by an inverted 'U' curve. Whereas low levels of anxiety evoked by the stimulus result in raised threshold, high levels result in lowered thresholds.

(c) Data from several lines of research (Hardy and Legge 1968, Broadbent and Gregory 1967, Dorfman 1967, Dixon and Lear 1963, Emrich and Heineman 1966, Worthington 1969) suggest that perceptual defence is a sensory phenomenon and involves the following stages of pre-conscious processing - cortical registration and analysis of the input, followed by emotional classification leading to a cortico-reticular interaction whereby the cortex, in setting its own level of arousal, determines the conscious threshold for awareness of the incident stimulus.

The interaction between the motive state of the subject and the emotional connotations of the stimulus, at a completely unconscious level of cerebral processing, has been shown in various paradigms. In an experiment by Lazarus and McCleary (1951) subjects produced electrodermal responses to shock associated nonsense syllables even when unable to report the critical stimuli. This so called subception effect has also been found in dichotic listening.

In studies of the latter phenomenon (Corteen and Wood 1972, Corteen and Dunn 1974) subjects had to shadow (repeat back) prose on one ear while individual words, including city names that had previously been associated with electric shock, were presented to the other ear. Though totally unaware of the words on the 'unattended' ear, those which had been associated with shock, produced significant electrodermal responses from the subject's hand. Since the monitoring of and response to, the words

on the 'unattended' ear did not interfere with the shadowing task we must suppose that the brain is capable of simultaneously processing two independent streams of information, one above, the other below, consciousness.

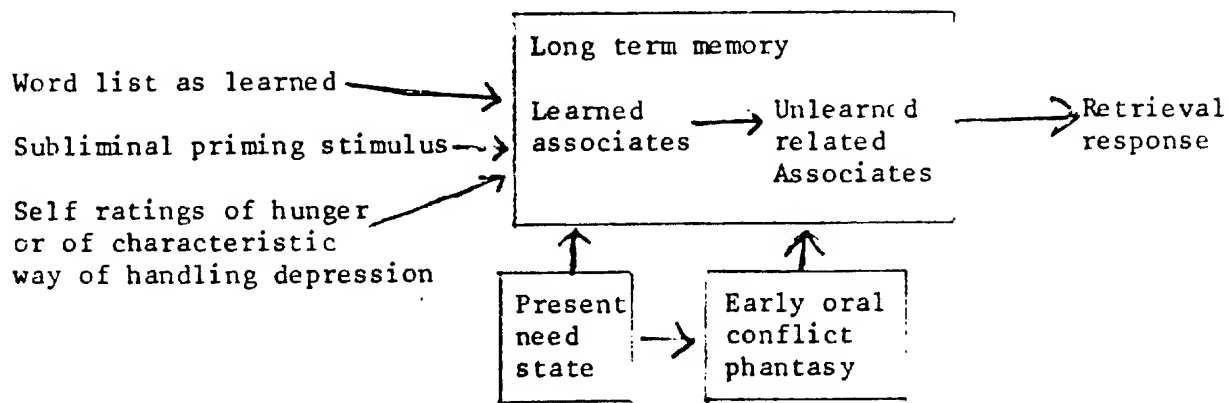
#### Subliminal perception and memory

Yet another point of contact between paranormal and subliminal phenomena is in connection with memory. In both cases it seems that ultimate responses are mediated by the brain's capacity to store information. Somehow, both extra sensory transmissions and subliminal stimuli gain access to unconscious memory. But here again emotion and motivation play a significant role. Researches by Spence and his colleagues (Spence and Ehrenburg 1964, Spence and Gordon 1967) illustrate this issue. In one study subjects who had been <sup>food</sup> deprived were required to learn and recall lists of words containing associates to the word 'cheese'. In a subsequent recall task only those subjects who were (a) hungry (b) had rated themselves for feelings of hunger and (c) had been presented with the subliminal word 'cheese' retrieved significantly more 'cheese associates' than those who had either not been hungry, or had not rated themselves for hunger, or had not received the subliminal stimulus 'cheese'.

In a second experiment (Spence and Gordon, 1967), involving a similar paradigm, only subjects who (a) had felt rejected by their peers (b) were characteristically prone to indulge in oral behaviour to reduce feelings of depression and (c) were presented with the subliminal word 'milk', showed significantly greater recall for associates to 'milk' in a memory task than did subjects who lacked any one of the preconditions for this improvement in retrieval from long term memory. A further significant and interesting result from this investigation was that the rejected, oral, 'subliminal', group actually 'recalled' associates to 'milk' which had not figured in the memory task. Since these intrusions were of such

early milk associates as 'suck' 'nipple' etc. Spence and Gordon concluded that the present state of need (to remove feelings of anxiety and depression),

plus the subliminal stimulus 'milk', served to activate a much older oral fantasy related to an early feeding situation. The concatenation of factors responsible for the data from these experiments are depicted in the following flow diagram:



#### Physiological bases of perception without awareness

A problem common to both sensory and extra sensory perception is the nature of those physiological processes which mediate between the external 'stimulus' and the response whereby the organism indicates that he has been affected by this stimulus. In the case of telepathic communication we simply do not know at what stage of cerebral processing the 'stimulus' gains access to and hooks into the cerebral mechanisms of the recipient. A look at data from studies of subliminal perception might at least suggest some hypotheses regarding possible points of entry for the so called extra sensory stimulus.

By way of a start let's put together the data from three lines of research. First there are the studies by Libet et al. (1967) which involved using subdural electrodes, placed directly upon the somatosensory cortex, to record the cerebral effects of a tactile stimulus applied to the hand area of fully conscious patients who had been undergoing stereotaxic therapy for intractable pain. The principal finding from this paradigm was that a subliminal tactile stimulus, applied to the hand, evoked the

early components of the compound evoked potential at the site of the

stimulation two things happened, pari passu with the subject reporting consciousness of the stimulus the later components of the evoked potential appeared in <sup>the</sup> E.E.G. record. This is probably the single most direct demonstration of the fact that consciousness of a previously subliminal stimulus depends upon coincident contribution from the ascending reticular activating system.

Other findings, pointing to the same conclusion, include Fuster's (1958) demonstration that monkey's tachistoscopic recognition thresholds for a food related stimulus may be modulated by concurrent stimulation of mesencephalic reticular system. Finally there are those studies of perceptual defence, mentioned earlier, which suggested that consciousness of a visual stimulus depends upon a preconscious semantic analysis and emotional classification at a cortical level leading to cortico-reticular interaction which in turn increases or decreases cortical arousal by the fibres of the ascending reticular system.

Our second set of data having possible relevance to both subliminal and extrasensory phenomena comes from studies of neurologically caused 'blind sight' (Weiskrantz and Warrington 1974; Poppel, Held and Frost 1973; Ikeda and Wright 1974). The main conclusion from these studies is that though cortically blind, through structural damage to the CNS, these organic patients may, nevertheless, respond to visual stimuli presented in those areas of the visual field from which they receive no conscious impression. In the light of related findings by Ikeda and Wright (1974) it has been suggested that this 'blind sight' is mediated by a secondary visual system involving the retina, the superior colliculus, the pulvinar and association cortex. Whether this system, which appears to operate without giving rise to conscious experience and evidently provides for the orienting response, is implicated in other sorts of subliminal or extra sensory perception remains an interesting possibility.



Yet a third group of experiments which we need to consider are those involving unconscious registration of external stimuli in pattern masking paradigms (Marcel and Paterson 1976), in binocular rivalry (Walker 1975), during fading of a stabilized image (Riggs and Whittle 1967) and in the evoking of 'K' complexes (in the EEG) by emotionally important auditory stimuli presented during sleep (Oswald, Taylor, and Treisman 1960). In all four of these paradigms not only does the brain continue to be affected by stimuli of which the mind remains unaware but, in at least two of them (pattern masking, and stimulation during sleep) carries out a complex semantic analysis of the stimulus inflow. Given that the end result of subliminal perception is almost indistinguishable from extrasensory perception, namely a purely statistical effect upon the probability matrix underlying the possible repertoire of behavioural and autonomic responses, it seems reasonable to ask at which processing stage extra sensory effects begin to be felt - at the peripheral receptor, the midbrain, thalamic relays, cortex, or reticular system? If the results of extra sensory perception are likened to those of subliminal perception then they must involve preconscious semantic analysis, emotional coding and access to long term memory. Hence we must assume that extra sensory effects lock into the nervous system at some stage prior to those responsible for these functions, yet capable of modulating the arousal systems of the brain. Sensory relays in the midbrain, thalamus, association cortex, or limbic system would all be possible candidates for this hypothetical mediating function. But let us look at some other factors which may be relevant to this problem, namely those subject and situational variables which appear to be critical for subliminal perception. As to the former the two most important appear to be arousal level and hemisphericity.

Whereas numerous researches (see Dixon 1971) have found that subliminal influences

between arousal and subliminal influences is also greatest in people showing right hemisphericity. Subliminal effects are generally weaker in people showing left hemisphericity and in that case depend upon attentive readiness.

As to situational variables the most striking finding to date from many researches (see Dixon 1971) is that subliminal effects appear negatively correlated with stimulus energy. The further below threshold, the weaker or briefer the stimulus, the stronger its effect which, as we noted earlier, may be qualitatively quite different from that of a supraliminal stimulus.

Subliminal perception, psychosomatic disorder and P.K.

There are grounds for believing (see Dixon 1978) that the processes underlying subliminal perception phenomena in normals are closely kin to those responsible for psychosomatic conversion symptoms in those patients who quite involuntarily and unconsciously transform psychic conflict into a somatic outlet.

The following similarities between subliminal and psychosomatic phenomena are particularly relevant to this viewpoint:

(a) In both subliminal and psychosomatic phenomena the individual may remain totally unaware of cause/effect relationships, of the contingencies between stimulus and response.

(b) In both 'syndromes' the stimulus makes contact with, and activates, complexes of emotionally charged ideas in unconscious long term memory.

(c) In perceptual defence as in psychosomatic disorder the subject is prevented from experiencing negative affect. In both cases he, in a sense trades negative affect for a somatic outlet.

(d) Both subliminal and psychosomatic disorders may involve the unconscious conversion of psychic material into a symbolic representation.

(e) In some psychosomatic disorders (e.g. asthma) a potentially threatening emotional stimulus may initiate a stress response involving

the autonomic nervous system. The same holds true for subception phenomena and in the subliminal effects demonstrated for dichotic listening (Corteen and Wood 1972).

(f) The very close relationship between the two classes of phenomena is confirmed by the fact that subliminal stimulation has been successfully used to investigate and to ameliorate psychosomatic symptomatology (see Beech 1959, C. Fisher 1954, S. Fisher 1968, Silverman 1976, Tyrer 1978) suggesting that identical processes may be involved in the two cases.

What possible relevance has all this to paranormal phenomena? Simply this. The psychosomatic process which seems to involve the same sort of mechanisms as underlie subliminal perception is a very special case of something that goes on in certain parapsychological demonstrations - namely an influence of mind - of knowledge and feelings about knowledge - upon matter.

Maybe a joint examination of the three sets of phenomena - the subliminal, the psychosomatic and the paranormal, may have a spin off for our comprehension of all three!

References

- Anderson, A., Fries, I. and Gudmund Smith, W. Change in afterimage and spiral after-affect serials due to anxiety caused by subliminal threat. Scan.J.Psychol., 11, 7-16, 1970.
- Beech, H.R. An experimental investigation of sexual symbolism in anorexia nervosa employing a subliminal stimulation technique: preliminary report. Psychosom.Med., 21, 277-80, 1959.
- Berger, R.J. Experimental modification of dream content by meaningful verbal stimuli. Brit.J.Psychiat., 109, 722-40, 1963.
- Broadbent, D.E. and Gregory, M. Perception of emotionally toned words. Nature, 215, No.5101, 581-4, 1967.
- Corteen, R.S. and Dunn, D. Shock-associated words in a nonattended message: a test for momentary awareness. J.exp.Psychol., 102 (6), 1143-1144, 1974.
- Corteen, R.S. and Wood, B. Autonomic responses to shock associated words in an unattended channel. J.exp.Psychol., 94, 308-313, 1972.
- Dixon, N.F. Symbolic associations following subliminal stimulation. Int. J.Psychoanal., 37(23), 159-70, 1956.
- Dixon, N.F. The effect of subliminal stimulation upon autonomic and verbal behaviour. J.Abnorm.Soc.Psychol., 57 (1), 29-36, 1958.
- Dixon, N.F. Subliminal Perception: the nature of a controversy. London: McGraw Hill, 1971.
- Dixon, N.F. Psychosomatic disorder: a special case of subliminal perception? John Wiley and Son (in press).
- Dixon, N.F. and Lear, T.E. Elctroencephalograph correlates of threshold regulation. Nature, London, 198, 870-2, 1963.
- Dixon, N.F. and Lear, T.E. Incidence of theta rhythm prior to awareness of a visual stimulus. Nature, 203, 167-70, 1964.
- Dorfman, D.D. Recognition of taboo words as a function of a priori probability. J.Person.and Soc.Psychol., 7 (1), 1-10, 1967.

- Emrich, H. and Heinemann, L.G. EEG bei unterschwelliger wahrnehmung emotional bedeutsamer wörter. Psychol.Forsch., 29, 285-96, 1966.
- Erdelyi, M. A new look at the New Look. Psych.Rev., 81 (1), 1-25, 1974.
- Fisher, C. Dreams and perception. The role of preconscious and primary modes of perception in dream formation. J.Amer.Psychoanal.Ass., 2 (3), 389-445, 1954.
- Fisher, S. and Cleveland, S. Body image and personality. Holt, Rinehart and Winston, 1968.
- Fonagy, P. The use of subliminal stimuli in highlighting function differences between the two hemispheres. Paper given to December meeting of the Experimental Psychology Society at Birkbeck College London. 1977.
- Fuster, J.M. Effects of stimulation of brain stem on tachistoscopic perception. Science, 127, 150, 1958.
- Gordon, G. Semantic determination by subliminal verbal stimuli: A quantitative approach. Ph.D. Thesis, University of London, 1967.
- Gordon, C.M. and Spence, D.P. The facilitating effects of food set and food deprivation on responses to a subliminal food stimulus. J.Person. 34, 406-15, 1966.
- Hardy, G.R. and Legge, D. Cross-modal induction of changes in sensory thresholds. Quart.J.Exp.Psychol., 20 (1), 20-9, 1958.
- Henley, S.H.A. Responses to homophones as a function of subliminal cues in the unattended channel. Brit.J.Psychol., 67(4), 559-67, 1976.
- Henley, S.H.A. Cross-modal effects of subliminal verbal stimuli. Scand. J.Psychol., 16, 30-36, 1975.
- Henley, S.H.A. and Dixon, N.F. Laterality differences in the effects of incidental stimuli upon evoked imagery. Brit.J.Psychol., 65(4), 529-536, 1974.

Ikeda, H. and Wright, M.J. Is amblyopia due to inappropriate stimulation of the 'sustained' pathway during development? Brit.J.Ophthal. 58, 165-175, 1974.

Kragh, U. Precognitive defensive organization with threatening and non-threatening peripheral stimuli. Scand.J.Psychol., 3, 65-8, 1962.

Lazarus, R.S. and McCleary, R.A. Autonomic discrimination without awareness: A study of subception. Psychol.Rev., 58, 113-23, 1951.

Libet, B., Alberts, W.W., Wright, E.W. and Feinstein, B. Responses of human somato-sensory cortex to stimuli below the threshold for conscious sensation. Science, 158 (No.3808) 1597-1600, 1967.

Miller, J.G. The role of motivation in learning without awareness. Amer.J.Psychol., 53, 229-39, 1940.

Mykel, N. and Daves, W. Emergence of unreported stimuli into imagery as a function of laterality of presentation. Brit.J.Psychol. (in press), 1978.

Marcel A. and Patterson, K. Word recognition and production: reciprocity in clinical and normal studies. In: "Attention and Performance VII" (ed.) J. Requin. Lawrence Erlbaum, New Jersey, 1976.

Ornstein, R.E. The Psychology of Consciousness. Penguin Books, 1977.

Oswald, L., Taylor, A.M. and Treisman, M. Discriminative responses to stimulation during human sleep. Brain, 83, 440-53, 1960.

Poppel, E., Held, R. and Frost, D. Residual visual function after brain wounds involving the central visual pathways in man. Nature, London, 243, 295-296, 1973.

the bottom p.4. →

Sackeim, H.A., Packer, I.K., Gur, R.C. Hemisphericity, cognitive set and susceptibility to subliminal perception. J.Abnorm.Psychol., 86(6), 624-630., 1977.

Silverman, L. Psychoanalytic theory "The reports of my death are greatly exaggerated". Amer.Psychologist, 31, 621-637, 1976.

Smith, G.J.W., Sjöholm, L., Nielzen, S. Sensitive reactions and after-

- Somekh, D.E., Wilding, J.M. Perception without awareness in a dichoptic viewing situation. Brit.J.Psychol., 64(3), 339-449, 1973.
- Spence, D.P. and Ehrenberg, B. Effects of oral deprivation on response to subliminal and supraliminal verbal food stimuli. J.Abnorm.Soc.Psychol., 69, 10-18, 1964.
- Spence, D.P. and Gordon, C.M. Activation and measurement of an early oral fantasy: an exploratory study. J.Amer.Psychoanal.Ass., 15(1), 99-129, 1967.
- Spence, D.P. and Holland, B. The restricting effects of awareness: A paradox and an explanation. J.Abnorm.Soc.Psychol., 64, 163-74, 1962.
- Tyrer, P., Lee, I. and Horn, S. Treatment of agoraphobia by subliminal and supraliminal exposure to Phobic ciné film. The Lancet, Feb.18th, 358-360, 1978.
- Tyrer, P., Lewis, P. and Lee, I. Effects of subliminal and supraliminal stress on symptoms of anxiety. J.Nerv.Ment.Dis., 166(2), 1978 (in press).
- Walker, P. The subliminal perception of movement and the 'suppression' in binocular rivalry. Brit.J.Psychol., 66(3), 347-356, 1975.
- Weiskrantz, L., Warrington, E.K., Sanders, M.D. and Marshall, J. Visual capacity in the hemianopic field following a restricted occipital ablation. Brain, 97, 709-728, 1974.
- Worthington, A.G. Paired comparison scaling of brightness judgements: a method for the measurement of perceptual defence. Brit.J.Psychol., 60(3), 363-8, 1969.

\*Riggs, L.A. and Whittle, P. Human occipital and retinal potentials evoked by subjectively faded visual stimuli. Vision Research, 7, 441-51, 1967.